OIPE IAP79 SEP 22 2005 PATENT & TRADEMARK OFFICE

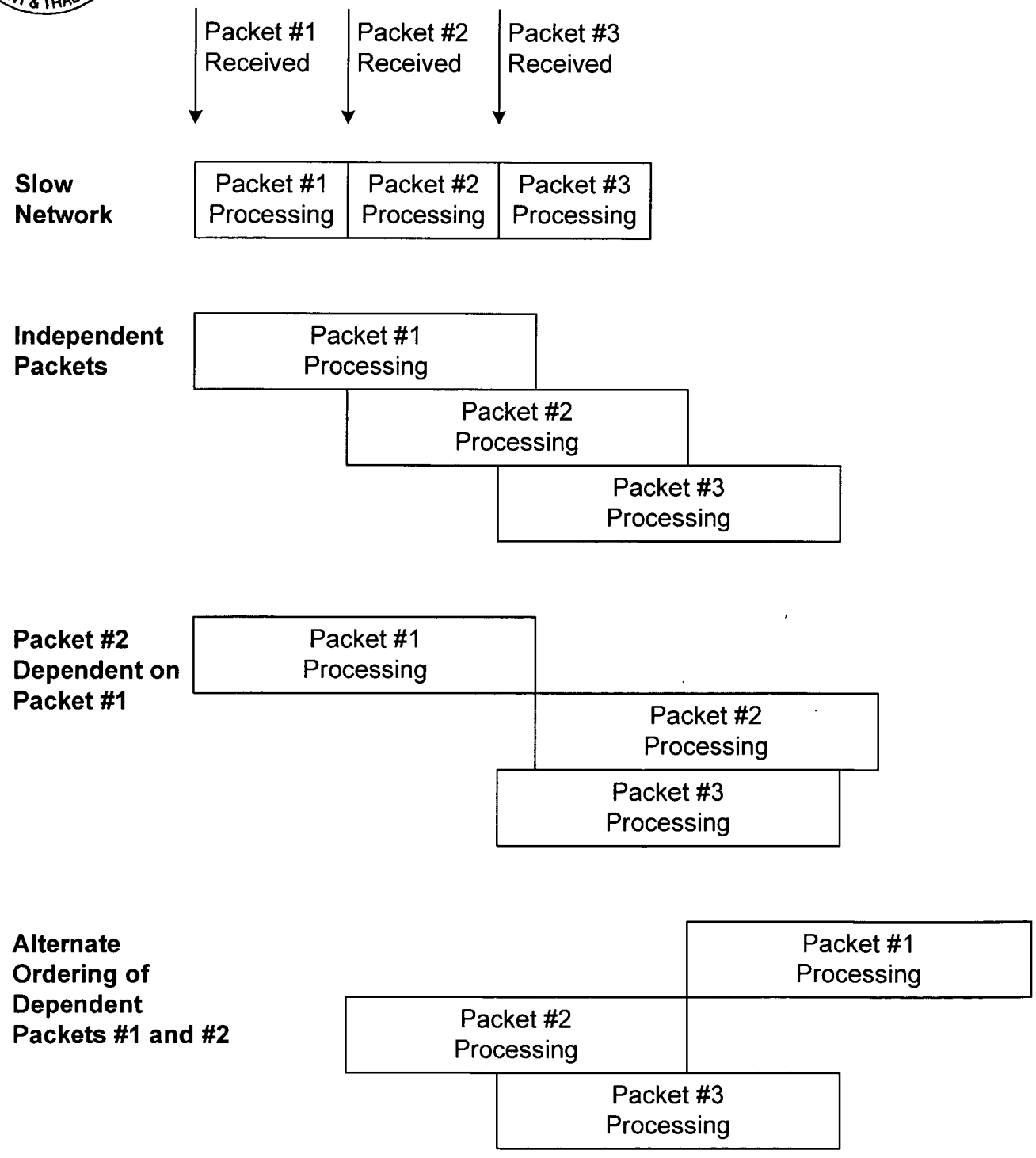

Fig. 1

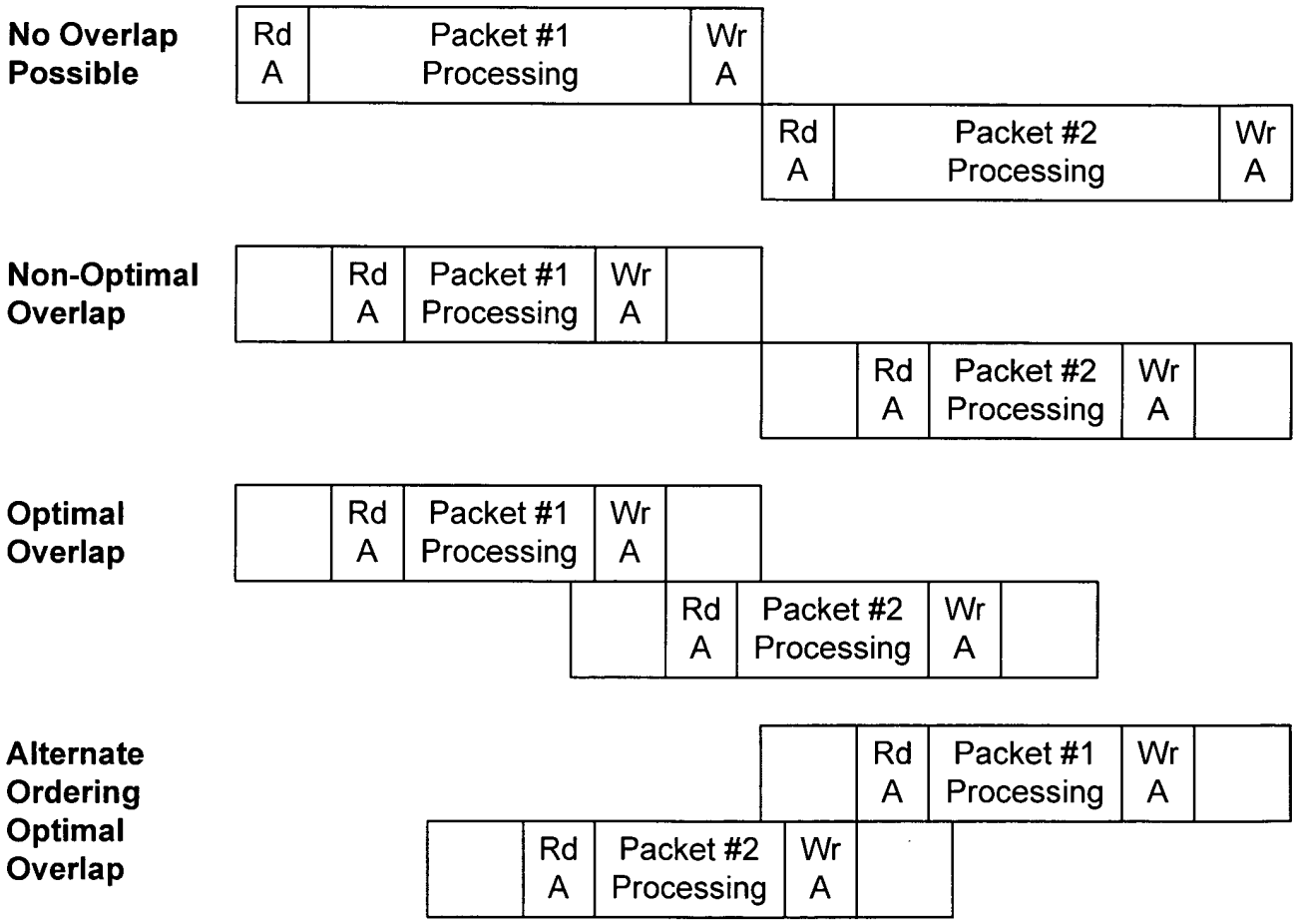
No Overlap Possible
Rd A
Packet #1 Processing
Wr A
Rd A
Packet #2 Processing
Wr A
Non-Optimal Overlap
Rd A
Packet #1 Processing
Wr A
Rd A
Packet #2 Processing
Wr A
Optimal Overlap
Rd A
Packet #1 Processing
Wr A
Rd A
Packet #2 Processing
Wr A
Alternate Ordering Optimal Overlap
Rd A
Packet #1 Processing
Wr A
Rd A
Packet #2 Processing
Wr A

Fig. 2

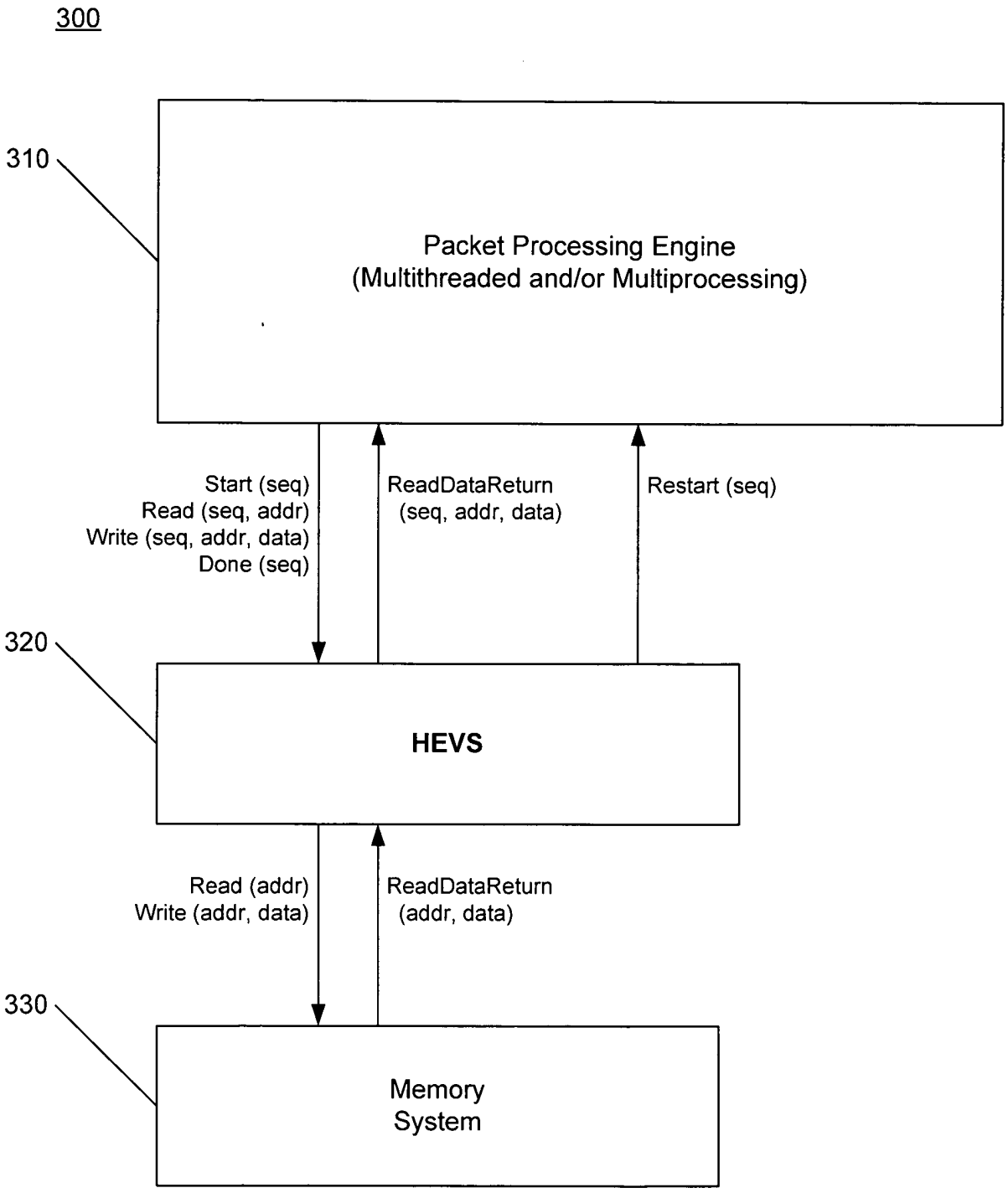
300
310
Packet Processing Engine
(Multithreaded and/or Multiprocessing)
Start (seq)
Read (seq, addr)
Write (seq, addr, data)
Done (seq)
ReadDataReturn
(seq, addr, data)
Restart (seq)
320
HEVS
Read (addr)
Write (addr, data)
ReadDataReturn
(addr, data)
330
Memory
System

Fig. 3

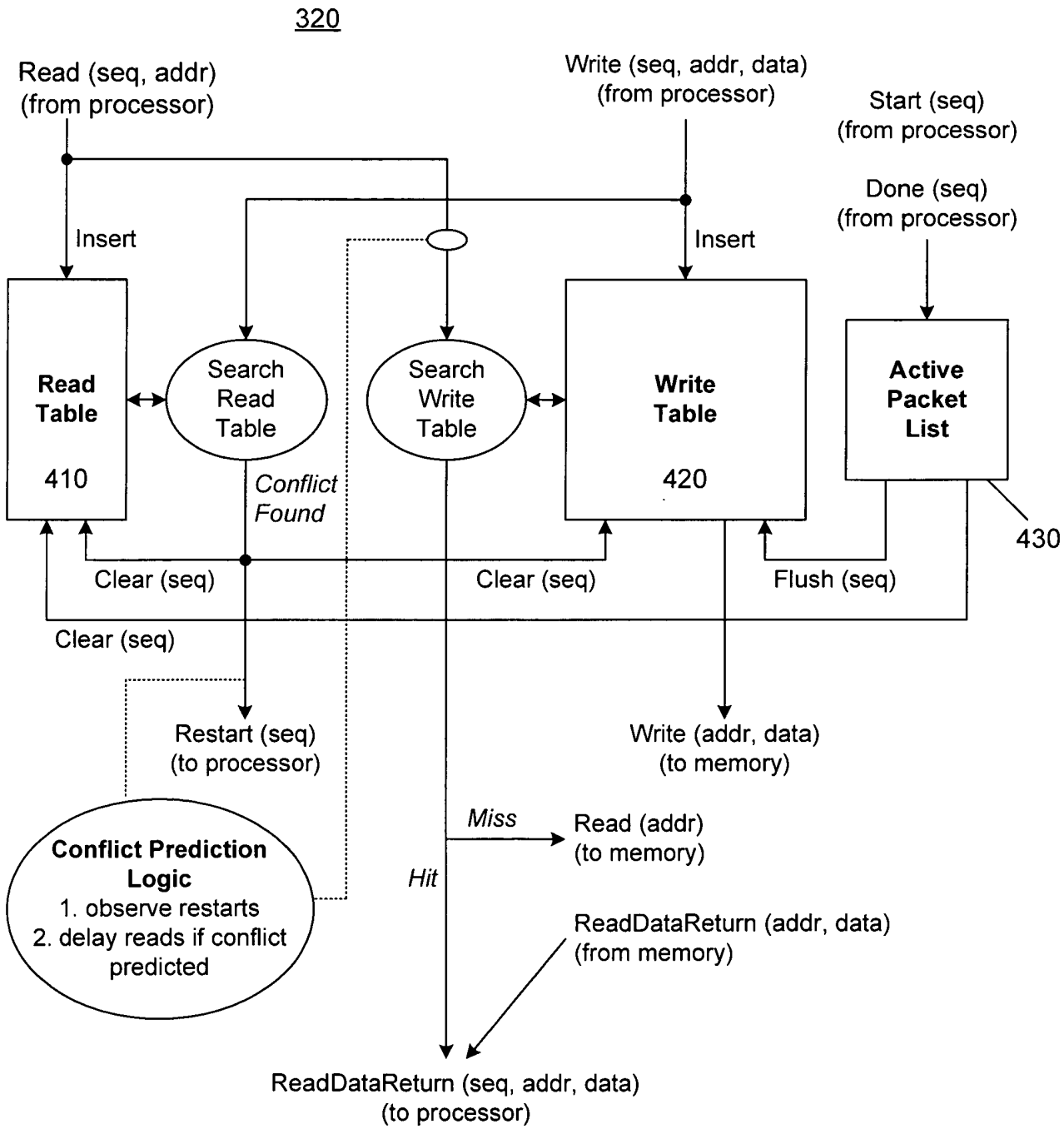
320
Read (seq, addr)
(from processor)
Write (seq, addr, data)
(from processor)
Start (seq)
(from processor)
Done (seq)
(from processor)
Insert
Insert
Read Table
410
Search Read Table
Search Write Table
Write Table
420
Active Packet List
430
Conflict Found
Clear (seq)
Clear (seq)
Flush (seq)
Clear (seq)
Restart (seq)
(to processor)
Write (addr, data)
(to memory)
Conflict Prediction Logic
1. observe restarts
2. delay reads if conflict predicted
Miss
Hit
Read (addr)
(to memory)
ReadDataReturn (addr, data)
(from memory)
ReadDataReturn (seq, addr, data)
(to processor)

Fig. 4

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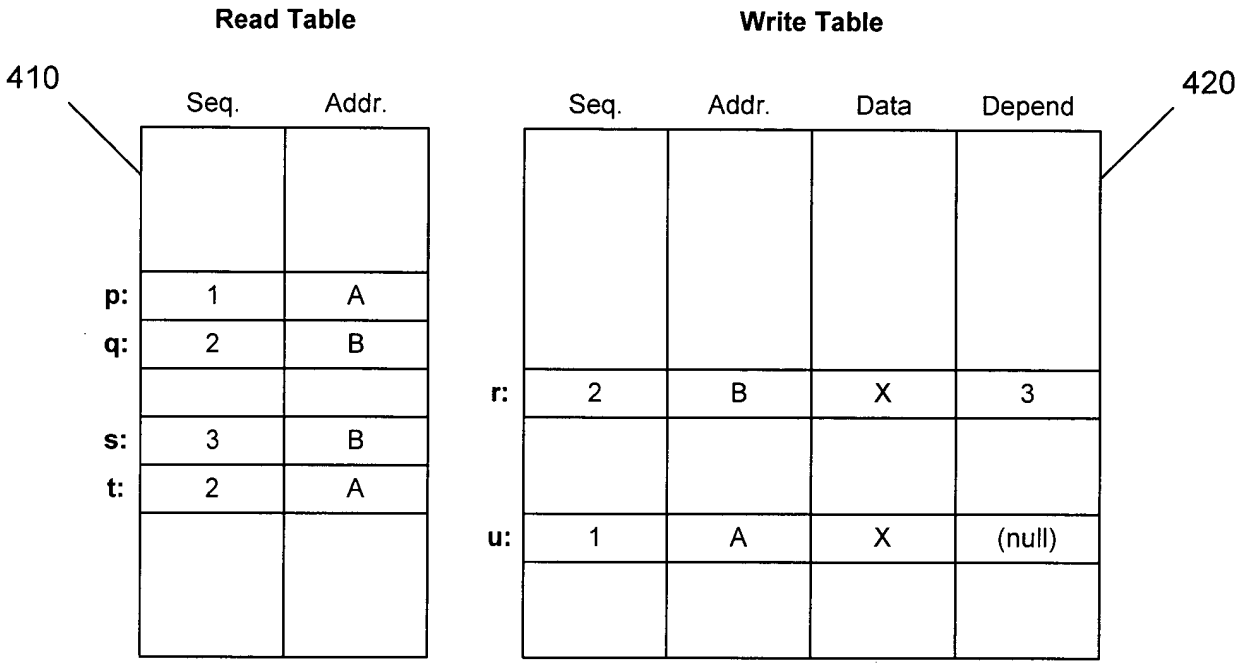

Time Sequence:

1. Packet #1 reads location A
   Entry **p:** created in Read Table
   Write Table is searched, no matches found so memory read is performed

2. Packet #2 reads location B
   Entry **q:** created in Read Table
   Write Table is searched, no matches found so memory read is performed

3. Packet #2 writes location B
   Entry **r:** created in Write Table
   Read Table is searched, no conflicts found

4. Packet #3 reads location B
   Entry **s:** created in Read Table
   Write Table is searched, entry r: found, data X forwarded and dependency list updated

5. Packet #2 reads location A
   Entry **t:** created in Read Table
   Write Table is searched, no matches found so memory read is performed

6. Packet #1 writes location A
   Entry **u:** created in Write Table
   Read Table is searched for newer sequence read, entry **t:** is found
      Conflict is signaled to processor, Packet #2 is restarted
      Entry **q:** and all other sequence 2 entries are deleted
      Deletion of entry **r:** triggers Packet #3 restart signaled

Fig. 5

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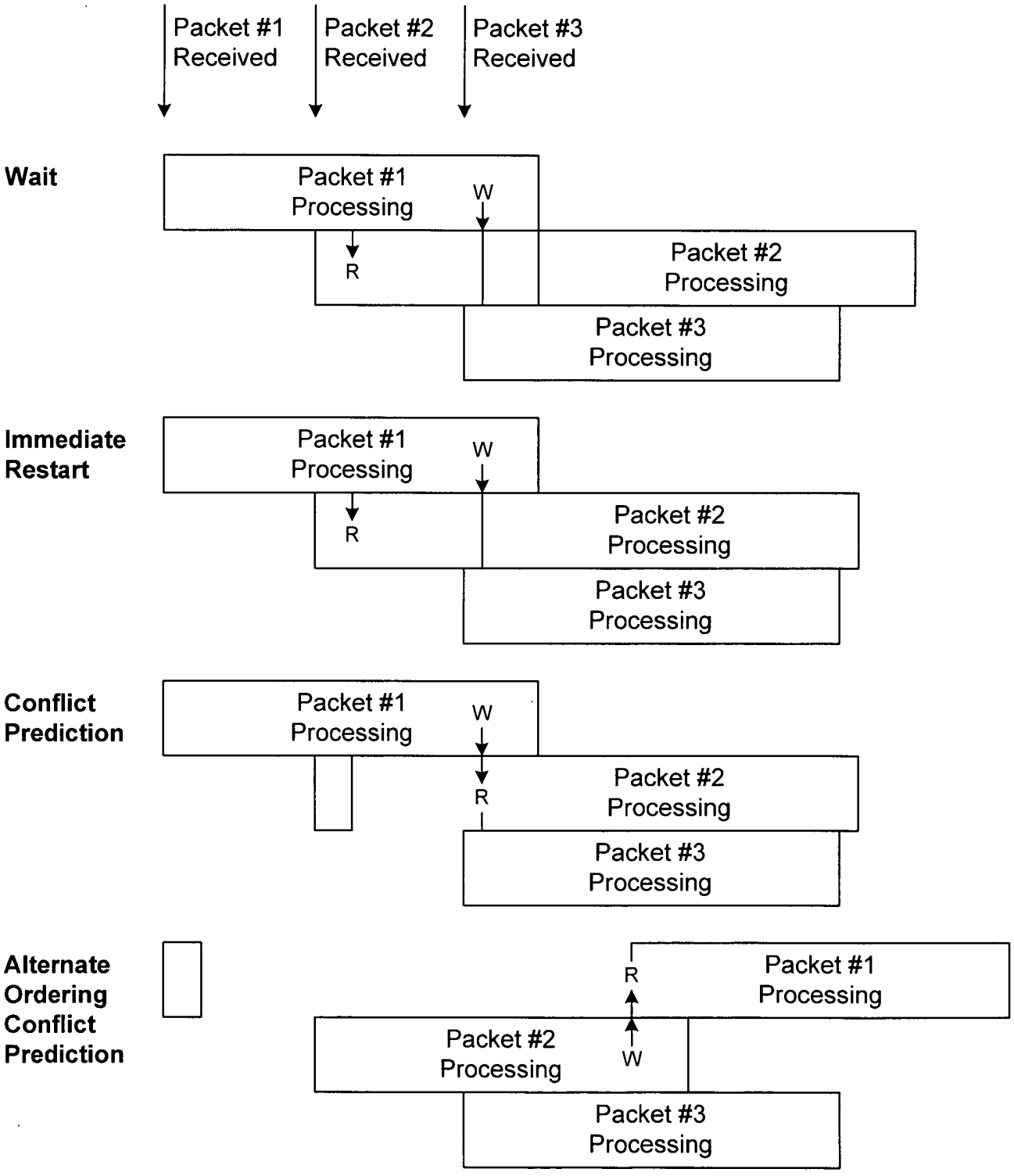
Packet #1 Received
Packet #2 Received
Packet #3 Received
Wait
Packet #1 Processing
W
R
Packet #2 Processing
Packet #3 Processing
Immediate Restart
Packet #1 Processing
W
R
Packet #2 Processing
Packet #3 Processing
Conflict Prediction
Packet #1 Processing
W
R
Packet #2 Processing
Packet #3 Processing
Alternate Ordering Conflict Prediction
R
Packet #1 Processing
Packet #2 Processing
W
Packet #3 Processing

Fig. 6